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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/752,656	12/29/2000	Beth C. Munoz	00140	9394

7590

07/29/2003

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EXAMINER

SINES, BRIAN J

ART UNIT

PAPER NUMBER

1743

DATE MAILED: 07/29/2003

10

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/752,656

Applicant(s)

MUNOZ ET AL.

Examiner

Brian J. Sines

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 – 5, 7 – 26 and 28 – 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Lewis et al. (U.S. Pat. No. 5,571,401 A). Regarding claims 1, 7, 22 and 28, Lewis et al. teach a sensor comprising a layer comprising conductive modified particles, wherein the sensor is electrically connected to an electrical measuring apparatus (see col. 3, line 36 – col. 8, line 17). Lewis et al. teach the incorporation of various organic conducting polymers (see col. 4, lines 18 – 34). Lewis et al. teach the incorporation of an aggregate or mixture comprising a carbon phase, such as various carbonaceous materials, and a silicon-containing phase, such as highly-doped semiconductors including silicon (see col. 4, lines 7 – 64). Regarding claim 2, Lewis et al. teach that the device may comprise an array of sensors (see col. 1, line 65 – col. 2, line 39; col. 3, lines 40 – 48). Regarding claims 3, 10, 12, 13, 24, 31, 33, 34 and 37, Lewis et al. teach that the conductive modified particles may comprise carbon products having attached at least one organic group via the incorporation of a main-chain polymer (see col. 4, lines 7 – 65). Lewis et al. teach that the resistors are fabricated by blending a conductive material with a nonconductive organic polymer to form a mixture or aggregate (see col. 3, lines 40 – 66). Therefore, at least one organic functional group provided by the incorporation of a nonconducting organic polymer is noncovalently attached to the conductive modified particles in

Art Unit: 1743

the aggregate material formed. The conductive particles are considered *modified* through their association with the nonconducting organic polymer in forming the aggregate material.

Regarding claims 4, 5, 11, 25, 26 and 32, Lewis et al. teach the use of carbon black, which is a black pigment (see col. 4, lines 17 – 34). Regarding claims 8 and 29, Lewis et al. teach the further incorporation of a metal-containing phase, such as a gold-copper alloy, highly-doped semiconductors, conductive metal oxides and superconductors (see col. 4, lines 19 – 34).

Regarding claims 9 and 30, Lewis et al. inherently anticipate the incorporation of a partially coated carbon black material having attached at least one organic group, such as an organic conducting polymer (see col. 3, line 34 – col. 4, lines 65). Regarding claims 14 – 16, 35 and 36, Lewis et al. teach the use of organic polymers containing ionizable groups (see col. 4, lines 7 – 65). Regarding claim 17, Lewis et al. teach that each sensor in a sensor array provides a different response for the same analyte with a detector that is operatively associated with each sensor (see col. 1, line 65 – col. 2, line 39; col. 7, lines 23 – 58). Regarding claim 18, Lewis et al. teach that the sensor arrays comprise a plurality of compositionally different chemical sensors (see col. 3, line 40 – col. 4, line 65). Regarding claims 19, 20 and 38, Lewis et al. teach a method for detecting the presence of an analyte in a fluid using a sensor array incorporating the recited structure, as discussed above (see col. 3, line 40 – col. 4, line 6; col. 7, line 23 – col. 8, line 19). Regarding claim 21, Lewis et al. teach that the method may further comprise a means to compare the response with a library of responses to match the response in order to determine the presence or the concentration of the analyte (see col. 7, lines 14 – 18). Regarding claim 39, Lewis et al. teach that the detector may be optimized to detect resistance (see col. 2, lines 1 – 39). Regarding claims 23 and 40, Lewis et al. teach that the method may incorporate a second

Art Unit: 1743

sensor, wherein the sensor comprises regions of conducting and nonconducting materials (see col. 1, line 65 – col. 2, line 39; col. 3, lines 40 – 48).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 6 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Li et al. (Langmuir 1993, 9, pages 3341 – 3344). Lewis et al. do not specifically teach the incorporation of C₆₀ buckyballs as a sensing platform. However, Lewis et al. do teach the incorporation of organic conductors, such as carbonaceous materials including carbon blacks, graphite, coke and C₆₀ materials (see col. 4, lines 17 – 34). Lewis et al. teach that individual elements can be optimized for a particular application by varying their chemical make-up and morphologies (see col. 6, lines 9 – 46). Lewis et al. teach that the conductive modified particles may comprise carbon products having attached at least one organic group (see col. 4, lines 7 – 65). Li et al. do teach the incorporation of self-assembled Buckminsterfullerene C₆₀ multilayers

Art Unit: 1743

(buckyballs) with a surface acoustic wave sensor (see pages 3341 – 3342; figure 1). Li et al. teach that sensor selectivity depends on optimum chemical or physical interactions between the analyte and the sensing layer, such as mutual matching of polarity, size and structural properties (see pages 3343 – 3344). The Courts have held that the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See In re Leshin, 125 USPQ 416 (CCPA 1960). Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the C₆₀ buckyballs having attached at least one organic group as a sensing platform, as taught by Li et al., with the sensing device, as taught by Lewis et al., in order to provide for an optimized sensing device.

Claims 6 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Ajayan (Chemical Review 1999, 99, pages 1787 – 1799). Lewis et al. do not specifically teach the incorporation of carbon nanotubes as a sensing platform. However, Lewis et al. do teach the incorporation of organic conductors, such as carbonaceous materials including carbon blacks, graphite, coke and C₆₀ materials (see col. 4, lines 17 – 34). Lewis et al. teach that individual elements can be optimized for a particular application by varying their chemical make-up and morphologies (see col. 6, lines 9 – 46). Lewis et al. teach that the conductive modified particles may comprise carbon products having attached at least one organic group (see col. 4, lines 7 – 65). Ajayan presents a review of the current state of carbon nanotube technology. Ajayan does teach the use of carbon nanotubes in sensors. Ajayan teaches that nanotubes may be functionalized at their ends with various functional groups and used as probes in chemical or biochemical applications (see page 1797). Ajayan also teaches that polymers may be physically doped (or filled) with nanotubes (see page 1796). The Courts have held that

Art Unit: 1743

the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See In re Leshin, 125 USPQ 416 (CCPA 1960).

Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the carbon nanotubes having attached at least one organic group as a sensing platform, as taught by Ajayan, with the sensing device, as taught by Lewis et al., in order to provide for an optimized sensing device.

Response to Arguments

Applicant's arguments filed 5/16/2003 have been fully considered but they are not persuasive.

With regards to the rejection of claims 1 – 5, 7 – 26 and 28 – 40 under 35 U.S.C. 102(b) as being anticipated by Lewis et al. (U.S. Pat. No. 5,571,401 A), the applicant's arguments are not commensurate in scope to the claims. The applicant alleges that Lewis et al. do not teach the use of “conductive modified particles” as taught in the applicant's specification. However, the applicant is advised that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The Patent Office applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art. See In re Morris, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). Furthermore, during patent examination, the pending claims must be interpreted as broadly as their terms reasonably allow. See In re Zletz, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). Lewis et al. do teach sensor arrays, which incorporate the use of particles, which are conductive and can be modified. For example,

Art Unit: 1743

Lewis et al. teach that the sensor arrays comprise a plurality of chemical sensors, wherein each sensor comprises at least first and second conductive leads electrically coupled to and separated by a chemically sensitive resistor. Each resistor is fabricated by blending a conductive particulate material, such as carbon black, with a nonconductive organic polymer, such as a main-chain carbon polymer, which inherently comprises organic functional groups (e.g, polydienes or polyalkenes, etc.) to form a blended mixture or aggregate material (see col. 3, lines 40 – 67 & col. 4, lines 1 – 64). The conductive particles are considered *modified* through their association with the nonconducting organic polymer in forming the aggregate material. Therefore, at least one organic functional group provided by the incorporation of a nonconducting organic polymer is *noncovalently attached* to the conductive modified particles in the aggregate material formed. The conductive modified particles may also be considered “modified” with regards to the processing involved in providing for their final structure. For example, Lewis et al. teach that conductive carbonaceous materials provided in a variety of modified structural forms, such as carbon black, graphite, coke, and C₆₀ materials, may be utilized (see col. 4, lines 19 – 34). Although the teachings of Lewis et al. may not be what the applicant intends as their own invention, the claim language does not *exclude* these structural limitations.

With regards to the rejection of claims 6 and 27 under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Li et al. (Langmuir 1993, 9, pages 3341 – 3344), the applicants arguments are not persuasive. The applicant alleges that since the primary reference, Lewis et al., does not teach the use of conductive modified particles having attached at least one organic group, it would not have been obvious to incorporate the use of buckyballs, as taught by

Art Unit: 1743

Li et al., as a sensing platform. However, contrary to the applicant's assertions, as discussed above, Lewis et al. do teach the use of conductive modified particles having attached at least one organic group in a sensor array. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Lewis et al. explicitly teach that carbonaceous, conductive C₆₀ materials may be utilized (see col. 4, lines 19 – 34). Lewis et al. teach that individual sensor resistor elements can be optimized for a particular application by varying their chemical make-up and morphologies or structural forms (see col. 6, lines 9 – 46). Li et al. do teach the incorporation of self-assembled Buckminsterfullerene C₆₀ multilayers (or buckyballs) with a surface acoustic wave sensor (see pages 3341 – 3342; figure 1). Li et al. teach that sensor selectivity depends on optimum chemical or physical interactions between the analyte and the sensing layer, such as mutual matching of polarity, size and structural properties (see pages 3343 – 3344). The Courts have held that the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See In re Leshin, 125 USPQ 416 (CCPA 1960). Therefore, it would have been considered obvious to one of ordinary skill in the art to incorporate C₆₀ buckyballs having attached at least one organic group as a sensing platform, as taught by Li et al., with the sensing device, as taught by Lewis et al., in order to provide for an optimized sensing device. In response to applicant's argument that it is

Art Unit: 1743

not clear what would result from a combination of the teachings of Lewis et al. and Li et al., or whether such a combination would even be physically possible, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

With regards to the rejection of claims 6 and 27 under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Ajayan (Chemical Review 1999, 99, pages 1787 – 1799), the applicants arguments are not persuasive. The applicant alleges that since the primary reference, Lewis et al., does not teach the use of conductive modified particles having attached at least one organic group, it would not have been obvious to incorporate the use of carbon nanotubes, as taught by Ajayan, as a sensing platform. However, contrary to the applicant's assertions, as discussed above, Lewis et al. do teach the use of conductive modified particles having attached at least one organic group in a sensor array. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Lewis et al. do teach the incorporation of organic conductors, such as carbonaceous materials including carbon blacks,

Art Unit: 1743

graphite, coke and C₆₀ materials (see col. 4, lines 17 – 34). Lewis et al. teach that individual elements can be optimized for a particular application by varying their chemical make-up and morphologies (see col. 6, lines 9 – 46). Lewis et al. teach that the conductive modified particles may comprise carbon products having attached at least one organic group (see col. 4, lines 7 – 65). Ajayan does explicitly state that carbon nanotubes may be utilized in sensors due to their extremely small size, good conductivity, high mechanical strength and elasticity (see p. 1797). Ajayan teaches that nanotubes may be functionalized at their ends with various functional groups and used as probes in chemical or biochemical applications (see page 1797). The Courts have held that the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See In re Leshin, 125 USPQ 416 (CCPA 1960). Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the carbon nanotubes having attached at least one organic group as a sensing platform, as taught by Ajayan, with the sensing device, as taught by Lewis et al., in order to provide for an optimized sensing device.

In response to applicant's argument that it is not clear what would result from a combination of the teachings of Lewis et al. and Ajayan, or whether such a combination would even be physically possible, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In response to applicant's argument that the Lewis et al. and Ajayan references are considered nonanalogous art

Art Unit: 1743

and therefore simply unrelated, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Lewis et al. do teach that carbonaceous materials, such as graphite, are suitable organic conductors for use in fabricating their disclosed sensor array (see col. 4, lines 17 – 34). Ajayan teaches that the carbon nanotubes, which are made from graphite, may be utilized in sensors due to their extremely small size, good conductivity, high mechanical strength and elasticity (see pp. 1791 & 1797). The Courts have held that the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See In re Leshin, 125 USPQ 416 (CCPA 1960). Therefore, the nexus between the two references is deemed sufficient to be suggestive to one of ordinary skill in the art of rendering obvious the incorporation of carbon nanotubes as a sensing platform, as taught by Ajayan, with the sensor array, as taught by Lewis et al.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

Art Unit: 1743


CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Sines, Ph.D. whose telephone number is (703) 305-0401. The examiner can normally be reached on Monday - Friday (11:30 AM - 8 PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (703) 308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

July 24, 2003


Jill Warden
Supervisory Patent Examiner
Technology Center 1700